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Les effets non réciproques de l'activation du schéma hostile et non hostile sur le processus d'attribution d'intention chez les individus non agressifs

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Résumé

L'attribution d'intention est un processus mental qui sert à expliquer des comportements ambigus d'autrui. Selon les recherches en cognition sociale, le processus d'attribution d'intention est influencé par des structures mentales appelées schémas cognitifs. L'objectif principal de ce mémoire est d'examiner les effets des schémas, plus spécifiquement le schéma hostile et non hostile, sur le processus d'attribution d'intention lié à des comportements ambigus négatifs et positifs d'autrui chez les individus non agressifs. Pour ce faire, nous avons formé deux groupes dont l'un amorcé avec des mots négatifs pour activer temporairement le schéma hostile et l'autre amorcé avec des mots positifs pour activer temporairement le schéma non hostile. Ensuite, ils étaient demandés de lire les scénarios sociaux illustrant des comportements ambigus positifs versus négatifs d'autrui suivis d'intentions d'autrui soient hostiles ou soient non hostiles. À l'aide de l'électroencéphalographie (EEG), nous avons mesuré et analysé la composante PRE (potentiel relié aux évènements) N400 associée à la présentation des intentions inattendues. Les résultats montrent que l'activation du schéma hostile mène les individus à attribuer et à s'attendre des intentions hostiles sans égard à la nature des comportements ambigus d'autrui alors que l'activation du schéma non hostile les mène à attribuer et à s'attendre des intentions non hostiles seulement lorsque les comportements ambigus d'autrui sont de nature positive. À la présentation des comportements ambigus négatifs d'autrui, le schéma hostile est activé naturellement menant les individus à attribuer des intentions hostiles, et ce, tout en conservant intact le schéma non hostile précédemment activé. Ces résultats démontrent que l'activation des schémas hostile et non hostile a des effets non réciproques sur le processus d'attribution d'intention.

Mots-clés : activation du schéma, N400, attribution d'intention, hostile, PRE

Abstract

Intention attribution is a mental process used to explain ambiguous behavior of others. According to research in social cognition, the intention attribution process is influenced by mental structures called schemas. The main objective of this thesis is to study the effects of schemas, more specifically the hostile and non-hostile schema, on the intention attribution process related to negative and positive ambiguous behaviors of others in non-aggressive individuals. To do this, we formed two groups, one primed with negative words to activate the hostile schema and the other primed with positive words to activate the non-hostile schema. Then, they were asked to read social scenarios illustrating positive or negative ambiguous behaviors of others, followed by the intentions of others, whether hostile or non-hostile. Using electroencephalography (EEG), we measured and analyzed the N400 ERP (event-related potential) component associated with the presentation of unexpected intentions. The results showed that the activated hostile schema leads individuals to attribute and to expect hostile intentions regardless of the nature of ambiguous behaviors, while the activated non-hostile schema leads them to attribute and to expect non-hostile intentions only when the ambiguous behaviors of others are positive in nature. When the ambiguous behaviors of others are negative, the hostile schema activates naturally and leads individuals to attribute hostile intentions, without influencing previously activated non-hostile. The results demonstrate that the activation of hostile and non-hostile schemas has non-reciprocal effects on the intention attribution process.

Keywords: schema activation, N400, intent attribution, hostility, ERP

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Liste des abréviations

ACI/ICA : analyse en composante indépendante

ANOVA : Analyse de variance

AN : ambigu négatif

AP : ambigu positif

CI/IC : composante indépendante

EEG: Électroencéphalographie

HEVP : *Hostile Expectancy Violation Paradigm*

Hz : Hertz

ms : milliseconde

PRE/ERP : Potentiels reliés aux évènements

TH : temporairement hostile

TNH : temporairement non hostile

μV : microvolt

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Chapitre I : Introduction générale

Introduction générale

La théorie de l'esprit réfère à la capacité d'attribuer des états mentaux à soi-même et à autrui, tout en reconnaissant que les autres puissent avoir des croyances, des désirs et des intentions différents des siens. Comme les états mentaux ne sont pas directement observables, la théorie de l'esprit permet d'avoir des pensées sur les pensées d'autrui pour faire sens de leur comportement observable (Premack et Woodruff, 1978; Frith, 1992). Le terme « théorie de l'esprit » était initialement utilisé par Premack et Woodruff (1978) dans leur étude sur la capacité des chimpanzés d'inférer des états mentaux d'autrui, plus spécifiquement le but ou l'intention d'autrui, sur la base des comportements observés. Les chercheurs ont montré à un chimpanzé, nommé Sarah, une série de courts vidéos illustrant chacun un comportement ambigu d'un acteur humain, soit l'action de sauter et de tendre la main à plusieurs reprises vers les bananes accrochées au plafond. Suite à la présentation de chaque vidéo, ils ont présenté à Sarah des photos d'objets dont un permettait de résoudre le problème de l'acteur (ex., un bâton permettant d'atteindre les bananes). Le fait que Sarah choisissait constamment des bons objets qui permettaient de résoudre les problèmes de l'acteur, les chercheurs ont conclu que Sarah, un chimpanzé, est capable à la fois de comprendre que chaque vidéo représente un problème et d'inférer les intentions de l'acteur en se basant sur ses comportements ambigus, de manière similaire à la façon dont les humains attribuent des intentions à des comportements d'autrui.

Le système d'inférences, c.-à-d. la théorie de l'esprit, est universel chez humain et il lui permet de comprendre le monde en général (Premack et Woodruff, 1978). Cependant, comme c'est un processus de déduction des états mentaux inobservables sur la base des comportements observables, il occasionne des inférences erronées dans certaines situations.

Le biais d'attribution d'intention hostile (Nasby, Hayden et dePaulo, 1980) désigne la tendance biaisée à attribuer des intentions hostiles aux comportements d'autrui qui sont ambigus et bénins. Dans l'étude de Dodge (1980, étude 2), l'expérimentateur a raconté aux enfants agressifs et non agressifs des histoires hypothétiques dans lesquelles figurait un pair dont les comportements entrainaient des conséquences négatives, mais dont les intentions étaient ambigües. Après chaque histoire, on demandait aux enfants de décrire le déroulement de l'incident, l'intention derrière le comportement aversif du pair et leur réaction face à cette provocation. Les résultats ont montré que les enfants agressifs avaient plus tendance à répondre avec l'agressivité en interprétant les comportements du pair comme ayant des intentions hostiles alors que les enfants non agressifs se sont restreints à émettre des réponses agressives en interprétant les comportements de leur pair comme ayant des intentions non hostiles ou bénignes. Des résultats similaires ont été obtenus dans l'étude de Nasby et al. (1980) où les adolescents agressifs ont plus fréquemment inféré de l'hostilité à partir des expressions faciales ambigües d'autrui que les adolescents non agressifs. Cette tendance à attribuer des intentions hostiles aux comportements aversifs non intentionnels a aussi été observée chez les adultes agressifs (Epps et Kendall, 1995, Matthews et Norris, 2002).

Deux théories ont été avancées pour expliquer le biais d'attribution d'intention hostile. La première théorie a été élaborée par Crick et Dodge (1994). Selon leur modèle du traitement de l'information sociale, un individu entre dans une situation sociale avec un ensemble des concepts mentaux en mémoire à long terme qui sont établis à partir des expériences du passé et des connaissances acquises. Il y reçoit une grande quantité d'informations sociales et il les traite à travers les six étapes suivantes : (1) l'encodage des indices sociaux, (2) l'interprétation de ces indices, (3) la clarification d'un ou de plusieurs objectifs d'interaction sociale, (4) l'accès à des réponses possibles, (5) la sélection d'une réponse à émettre et (6) la production d'un comportement. Selon Crick et Dodge (1994), le biais d'attribution d'intention hostile se produit lors des deux premières étapes du modèle de la manière suivante : chez l'individu agressif, le schéma hostile guide l'attention vers des indices hostiles présentés dans le contexte social et cela entraîne l'encodage sélectif de ces mêmes indices hostiles au détriment d'autres indices. En se basant sur ces indices hostiles encodés en mémoire, l'individu interprète la situation sociale de manière hostile et ainsi attribue une intention hostile au comportement ambigu d'autrui. Cependant, les études récentes en cognition visuelle ont critiqué cette explication en démontrant que l'attention des personnes agressives est plus attirée par des indices non hostiles que hostiles, une observation que l'on explique par une habituation possible aux indices hostiles et une saillance des indices non hostiles par rapport aux autres indices dans le contexte social (Henderson, Weeks et Hollingworth, 1999; Rinck, Gamez, Diaz et de Vega, 2003).

La deuxième théorie expliquant le biais d'attribution d'intention hostile chez les personnes agressives a été avancée par Huesmann (1988). Il décrit qu'un script (ou appelé aussi schéma) mental est l'ensemble des comportements appris lors du développement précoce et stockés dans la mémoire à long terme. Selon lui, un script suggère la façon dont un individu devrait se comporter dans une situation sociale. Tout comme un enfant peut encoder un ensemble de mouvements servant au lancement d'une balle par l'observation des autres, l'enfant peut également encoder un script mental des comportements agressifs en observant des réactions agressives d'autrui. Plus la scène d'agression observée par l'enfant est saillante, plus l'enfant ruminera et imaginera répétitivement la scène observée et plus facilement l'enfant accèdera au schéma lié aux comportements hostiles dans une interaction sociale future. Face à un problème social, si l'enfant se comporte de manière agressive pour le résoudre et s'il obtient une rétroaction positive suite au comportement agressif (ex., l'enfant réussit à avoir ce qu'il a désiré en frappant un camarade de classe), le schéma agressif qui a suscité ce comportement agressif sera renforcé et sera utilisé de nouveau dans l'avenir. En outre, l'exposition répétitive à des stimuli hostiles à long terme et l'accumulation des concepts agressifs à travers des expériences de vie contribueraient à cette accessibilité accrue au schéma agressif/hostile. Donc, le fait que chez les individus agressifs, le schéma hostile est le plus accessible et disponible cognitivement, c'est ce même schéma qui influencerait leur jugement (Tversky et Kahneman, 1974), notamment le processus d'attribution d'intention, et ceci expliquerait la tendance biaisée des personnes agressives à attribuer des intentions hostiles à des comportements ambigus d'autrui.

L'exposition aux stimuli agressifs semble avoir un effet cumulatif à long terme comme par exemple, le développement de l'accessibilité chronique et accrue au schéma agressif chez les enfants agressifs, mais il semble également avoir des effets à court terme sur la population générale en augmentant temporairement l'accessibilité au schéma hostile déjà existant. Les recherches en cognition sociale sur l'automaticité stipulent que les processus cognitifs peuvent être déclenchés et mis en marche automatiquement par l'exposition à certains indices sociaux (voir Todorov et Bargh, 2002). Il est suggéré que l'exposition à des indices sociaux active automatiquement des concepts mentaux qui leur sont liés et ceci de manière non consciente (Neely, 1977), et cela augmente temporairement la possibilité d'utiliser le schéma activé dans l'évaluation des informations subséquemment perçues (Higgins, 1996; Sedikides et Skowronski, 1991).

Higgins, Rholes et Jones (1977) ont étudié l'influence de la préexposition (c.-à.-d. l'amorçage) à un trait de personnalité sur l'évaluation d'autrui et leurs résultats ont montré que l'évaluation d'un stimulus-personne était biaisée par la valence (positive vs négative) des mots auxquels ils étaient préexposés. En d'autres termes, le fait d'être exposé précédemment aux mots négatifs (ou positifs) liés à un trait de personnalité aurait augmenté l'accessibilité au schéma négatif (ou positif) et cela a mené les sujets à évaluer négativement (ou positivement) le stimulus-personne qui était subséquemment présenté. Meier, Robinson et Wilkowski (2007) ont montré que l'activation du schéma hostile des individus non agressifs par l'amorçage les a menés à attribuer des intentions hostiles aux comportements ambigus d'autrui, et cela aussi fréquemment que les individus agressifs non amorcés.

En bref, la littérature suggère que tant les personnes agressives et que non agressives ont la capacité d'attribuer des intentions hostiles aux comportements ambigus d'autrui dans un contexte social donné. Si c'est le cas, quelle est donc la différence entre les personnes agressives et non agressives au niveau du processus d'attribution d'intention ?

Les schémas selon Bartlett (1932) sont des structures mentales qui s'établissent à partir des expériences du passé et qui se développent avec des vécus personnels. Sous la perspective développementale de Dodge (2006), la différence entre les personnes agressives et non agressives sur le plan d'attribution d'intention se repose sur l'utilisation ou non d'un schéma non hostile. Dans son article théorique, il propose qu'un comportement agressif soit une réaction universelle de l'être humain qui se manifeste dès la première année de la vie pour se défendre contre les provocations négatives, conflictuelles et menaçantes à la survie. Lorsque les enfants développent la capacité d'inférer des intentions d'autrui, ils attribuent naturellement une intention cohérente avec la nature des comportements perçus, ce qui explique le fait que les enfants attribuent des intentions hostiles à des comportements ambigus aversifs d'autrui. Selon Dodge (2006), les enfants développent normalement avec l'âge des concepts non hostiles en se basant sur des expériences non hostiles et ainsi, ils acquièrent la capacité d'identifier des indices bénins et d'attribuer des intentions non hostiles. Cependant, il précise que certains enfants ne réussissent pas à développer des schémas non hostiles, ni le style d'attribution d'intention bénigne. Par exemple, les enfants qui ont vécu des expériences négatives telles que l'abus physique, l'utilisation constante d'attributions hostiles par l'entourage, l'échec dans des activités occupationnelles importantes de la vie et les cultures qui valorisent l'autodéfense, la réputation personnelle et la vengeance sont moins susceptibles de développer un schéma non hostile et le style d'attribution d'intention bénigne. Au lieu de cela, ils continuent d'utiliser leurs schémas hostiles et d'attribuer des intentions hostiles aux comportements ambigus d'autrui.

Si les schémas hostiles et non hostiles coexistent chez des individus non agressifs comme le suggère Dodge (2006) et si l'activation d'un schéma hostile conduit à une attribution d'intention hostile comme le suggère la littérature en cognition sociale, l'activation du schéma non hostile ainsi que ses effets sur le processus d'attribution d'intention méritent aussi d'être examinés pour comprendre de manière complète la relation entre les schémas cognitifs et les processus d'attribution d'intention chez personnes non agressives. En outre, les stimuli expérimentaux principalement utilisés dans les études antérieures pour mesurer le processus d'attribution d'intention étaient des comportements ambigus d'autrui de nature aversive permettant des interprétations à la fois hostiles et non hostiles. Cependant, aucune étude publiée à notre connaissance n'a vérifié si les individus non agressifs avec un schéma hostile activé continueront d'attribuer des intentions hostiles face à des comportements ambigus d'autrui de nature non aversive (ou positive) sous l'effet de l'activation du schéma hostile. Inversement, on peut se demander si ces mêmes individus non agressifs attribueront des intentions non hostiles à des comportements ambigus aversifs (ou négatifs) d'autrui lors de l'activation du schéma non hostile.

C'est dans ce contexte que l'étude rapportée dans l'article scientifique qui suit avait pour objectif d'examiner les effets de l'activation des schémas hostile et non hostile chez les personnes non agressives sur leur processus d'attribution d'intention lié à des comportements ambigus négatifs et positifs d'autrui. En plus du fait qu'aucune étude publiée, à notre connaissance, n'a traité de ce sujet, nous avons utilisé un paradigme expérimental innovant en combinant la méthode d'amorçage et la mesure électroencéphalographie (EEG) dans le but d'activer les schémas hostile et non hostile par une manipulation expérimentale et de mesurer les processus cognitifs spontanés de manière objective et en temps réel. Les hypothèses émises s'accordent avec l'idée que les participants non agressifs attribueront des intentions concordantes avec les schémas (hostiles vs non hostiles) activés sans égard à la nature des comportements ambigus (négatifs vs positifs) d'autrui.

Chapitre II : Article scientifique

The non-reciprocal effects of hostile and non-hostile schema activation on intent attribution processes in non-aggressive individuals: An ERP study.

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Abstract

We investigated intent attribution processes of non-aggressive individuals by activating hostile and non-hostile schemas and by presenting ambiguous-negative and ambiguous-positive behaviors of others. Thirty-eight participants were randomly assigned to one of two groups, one primed with negative words and one with positive words, to be conditioned as temporarily hostile (TH) or as temporarily non-hostile (TNH). They were asked to read social scenarios composed of ambiguous-positive or ambiguous-negative behaviors of others followed by hostile versus non-hostile intentions related to the preceding ambiguous behavior. Neural activity related to spontaneous intent attribution processes was recorded using electroencephalography (EEG). Event-related potentials (ERPs) associated with the presentation of unexpected intentions produced an N400 component. Ambiguous-positive behaviors followed by hostile intentions elicited a larger N400 effect than for non-hostile intentions in the TNH group whereas a larger N400 effect was observed when ambiguous-positive behaviors were followed by non-hostile intention than by hostile intention was observed in the TH group. However, for ambiguous-negative behaviors, non-hostile intentions resulted in a larger N400 effect than hostile intention in both groups. The findings suggest that the activation of hostile and non-hostile schemas have different effects on intention attribution processes depends on the negative versus positive nature of ambiguous behaviors of others in social contexts. More specifically, it is proposed that the hostile schema is more easily accessible through ambiguous-negative behaviors in the context of pre-activated non-hostile schema than is the non-hostile schema through ambiguous-positive behaviors in the context of pre-activated hostile schema in non-aggressive individuals.

Keywords: schema activation, N400, intent attribution, hostility, event-related potentials

1. Introduction

The capacity to perceive correctly the intent behind the behavior of others has a clear adaptive value because attributing the wrong intention can lead to inappropriate and/or detrimental actions. For example, failing to infer hostile intentions from aggressive behavior of others could expose oneself to danger; conversely, attributing hostile intentions to benign behaviors could motivate one to react aggressively without good reason (Björkqvist, Lindstrom, & Pehrsson, 2000). Research in social cognition has found a biased tendency among aggressive individuals to interpret the ambiguous or benign behaviors of others as resulting from a hostile intention (termed as Hostile Attribution Bias, HAB; Nasby, Hayden, & DePaulo, 1980), relative to the interpretations of non-aggressive individuals. Some researchers explained this phenomenon as a reflection of selective attention to hostile cues favoring hostile interpretation (Dodge & Crick, 1990, 1994), whereas others have proposed an increased accessibility to hostile concepts (or schemas), suggesting hostile intentions, fostered by recurrent hostile experiences (Dodge, 1993; Huesmann, 1988). However, the empirical results supporting these hypotheses have been questioned and criticized for their methodological limitations (Zelli, Huesmann, & Cervone, 1995). In order to measure hostile attribution biases, traditional studies have used experimental paradigms that explicitly instruct subjects to deliberate on the possible hostility of others' intentions underlying ambiguous behaviors. However, results obtained with such methods are likely to be influenced by social desirability and defensive attitudes. Moreover, methods allowing participants to take time to think before giving their answers could limit the validity of the measurements for spontaneous, spur-of-the-moment, attributions of intention. To palliate this limitation, implicit methods such as cue-recall paradigms or physiological measures, were developed to study objectively spontaneous intent attribution processes. For example, in order to test the hypothesis that chronically-accessible hostile schemas may influence the encoding of social information, even when subjects have no deliberate intention of making any inference, Zelli et al. (1995) used a cue-recall paradigm. Aggressive and non-aggressive individuals were asked to memorize a series of sentences describing social situations open to hostile or non-hostile interpretations (e.g., “The receptionist raises his voice when Keith starts talking”) and to recall them afterwards using a list of words composed of hostile dispositional words and non-hostile semantic words. More specifically, they were asked to use these words to recall as many sentences as possible. The results showed that aggressive individuals used more hostile dispositional word cues (e.g., Mean) than non-hostile semantic word cues (e.g., Telephone) to recall sentences, while the opposite pattern (better recall with non-hostile cues than with hostile cues) was observed for non-aggressive individuals. Zelli et al. (1995) argued that even though subjects had not been explicitly instructed to deliberate upon social encounters, aggressive people spontaneously inferred hostility to ambiguous behavior of others while reading and learning social scenarios, which resulted in better recall of scenarios later, given hostile dispositional cues. In contrast, non-aggressive people were assumed not to have inferred hostility under such implicit conditions, so non-hostile semantic word cues were more useful for them to recall scenarios. These results suggest that aggressive individuals spontaneously infer hostility to characters while they learn the sentences more frequently than non-aggressive individuals. A limitation of the cue-recall paradigm is that it does not track the attribution processes immediately, as it is occurring, but instead it provides a later reflection of the hypothesized attribution bias on later recall from long-term memory.

In order to study the spontaneous cognitive process of social attribution in more direct manner, the use of methods measuring neural activity was recommended (Bartholow, 2010).

Here we called upon electroencephalography (EEG) to track the spontaneous social attributions of subjects reading short social scenarios using methods similar to those developed by Gagnon et al. (2016). They focused on the N400 component, characterized by a negative deflection in centroparietal region around 400 milliseconds after stimulus onset in the presence of information that is difficult to integrate with previous context (e.g., cognitive inconsistency). According to Kutas and Federmeier (2011), words that are unexpected or inconsistent with the presented context elicited a larger N400 amplitude than expected or coherent words. Van Berkum, van den Brink, Tesink, Kos, and Hagoort (2008) violated social stereotypes by matching a type of speaker with a lexical content (e.g., an adult voice saying, “I cannot sleep without my teddy bear in my arms”) and examined if this inconsistency triggers an N400 effect. The results showed that the unexpected target word (e.g., teddy bear) from a stereotyped voice speaker (e.g., an adult voice) elicited an N400 effect. Leuthold, Filik, Murphy, and Mackenzie (2002) presented socio-emotional responses of fictional characters that either matched/consistent or mismatched/inconsistent with preceding social context and measured underlying neural activities with EEG. They found that inconsistent socio-emotional responses with social contexts elicited a larger amplitude of the N400 than consistent ones.

To study brain mechanisms associated with expectations of hostile/non-hostile intent and their on-line evaluation, Gagnon et al. (2016) presented to readers scenarios with a hostile versus non-hostile social context followed by a character’s ambiguous aversive behavior, and recorded and analyzed event-related brain potentials (ERPs) to critical words that disambiguated the hostile versus non-hostile intent behind the behavior (see section 2.2.2. for details about Hostile Expectancy Violation Paradigm). The results showed that a larger N400 effect was found in hostile mismatch condition (hostile context followed by non-hostile intention) than in hostile match condition (hostile context followed by hostile intention), suggesting that non-aggressive individuals spontaneously inferred hostile intentions while merely reading ambiguous behaviors (c.f. Zelli et al., 1995) presented in a hostile social context. A subsequent study examining the inference process in aggressive and non-aggressive individuals using the EEG method also supported these findings (Gagnon et al., 2017).

In sum, current data suggest that non-aggressive individuals are more likely to attribute two types of intention, hostile and non-hostile, when facing ambiguous behavior of others. Whereas their hostile intent attribution can develop spontaneously in a hostile context, little is known about the processes underlying their attribution of non-hostile intent in various contexts. Two explanations have been proposed about the origin of non-hostile intent attribution in non-aggressive people. First, Wilkowski and Robinson (2007; study 3 and 4) posit that low-trait-anger individuals spontaneously recruit and use the limited-capacity cognitive control to override activated hostile thoughts and to be less reactive to hostile stimuli. They measured response times in a simple cognitive task (i.e. tell if the presented letter was whether p or q) preceded by clearly hostile versus non-hostile words. The results showed that the mean response time was greater when the cognitive task was preceded by hostile words than by non-hostile words. Wilkowski and Robinson (2007) suggested that the recruitment of limited-capacity cognitive control served to inhibit hostile concepts in low-anger-trait individuals. Such a capacity would allow non-aggressive individuals to deliberately develop alternative non-hostile interpretation of intent behind others' behaviors. However, this explanation seems to be insufficient regarding the question about the interpretation of ambiguous behaviors of others since the experiment material was composed of clear hostile and non-hostile words instead of ambiguous cues. Also, it is uncertain if the inhibition of hostile concepts actually leads to non-hostile intent attributions.

Another explanation was proposed by Dodge (2006), from a developmental perspective. Dodge described aggressive behavior as a universal reaction against negative, conflictual, and threatening provocations to the survival of the individual. When children develop the ability to infer intention in others, they naturally attribute an intention that is coherent with the nature of the perceived behaviors. This explains the reason why they attribute hostile intentions to provocative and negative behaviors. According to Dodge (2006), children normally develop non-hostile concepts and the ability to identify benign cues as well as to infer benign intentions in others' behavior, when appropriate. However, not all children develop this benign attribution style. For example, children who have experienced physical abuses, frequent use of hostile attributions by significant others, failure in important tasks in life, and cultures that value self-defence, personal reputation, and/or revenge, are less likely to develop a benign attribution style. Instead, they are more likely to infer hostile intentions, to interpret others' behavior in reference to hostile concepts (or hostile schemas) and thus, to develop a chronic hostile attribution style.

If non-aggressive individuals have two types of schemas (hostile and non-hostile) in their knowledge structures, as suggested by Dodge (2006), one can wonder if the activation of non-hostile schema is involved in their non-hostile intent attribution when facing social cues that remain ambiguous.

Anderson, Benjamin, and Bartholow (1998) have shown that the mean response time in the vocalization of a target word (i.e. reading the target word aloud) was greater when aggressive target words were followed by non-weapon primes (e.g., animal names in study 1 or drawings of plants in study 2) than by weapon primes (e.g., weapon names or drawings of weapons), indicating that the priming with negative stimuli increase the accessibility of aggression-related thoughts. Srull and Wyer (1979, study 1) showed that the increase in number of aggressive primes (i.e. increased accessibility of aggression-related thoughts) leads individuals to rate ambiguous-aversive behaviors of others as more aggressive than non-aggressive. Also, Meier, Robinson, and Wilkowski (2007) found that individuals with low trait aggression primed with hostile words attribute hostile intentions to ambiguous behavior of others as often as unprimed individuals with high trait aggression. While the relationship between the activation of hostile schema by priming and the hostile intent attribution has empirical supports, the relationship between the activation of non-hostile schema by priming and the non-hostile intent attribution remains unclear.

Srull and Wyer (1979, study 2) were interested in the activation of non-hostile schema with kindness-related priming words, but instead of investigating its effects on intent attribution processes, they studied the effects on the assessment of ambiguous-kind behaviors of others using a scale from 0 (“not at all kind”) to 10 (“extremely kind”). To our knowledge, no study has investigated the influence of non-hostile priming beyond the identification of ambiguous behaviors of others as positive or negative behaviors, more specifically its influence on intentions that individuals attribute to ambiguous behaviors of others. If both hostile and non-hostile schemas coexist in non-aggressive individuals and if the activation of hostile schema leads to hostile intent attribution, the effects of non-hostile schema activation on intent attribution process deserve to be examined in order to provide a complete picture of the relationship between cognitive schemas and intent attribution processes. Furthermore, the experimental stimuli mainly used in previous studies to measure intent attribution processes were ambiguous-aversive behaviors of others allowing both hostile and non-hostile interpretations. However, it is uncertain if non-aggressive individuals with an activated hostile schema will continue to attribute hostile intentions when facing ambiguous-non-aversive (or positive) behaviors of others. Conversely, it is also uncertain if non-hostile intentions will be attributed to ambiguous-aversive (or negative) behaviors of others when a non-hostile schema is activated in non-aggressive individuals.

1.1. Objectives of the present study

The aim of the present study was to examine the effect of temporarily activated hostile and non-hostile schemas in non-aggressive individuals on the intent attribution processes related to ambiguous aversive (negative) and ambiguous non-aversive (positive) behaviors of others in a social context. The electroencephalography (EEG) method was adopted in our study to objectively measure and to analyze on-line neural activities underlying the intent attribution processes, more specifically the N400 ERP component. We assigned subjects at random to one of two groups, one exposed to a list of positive words, the other to negative words, to activate relevant schemas that increase the likelihood of its use (Todorov & Bargh, 2002; Higgins, 1996). We will refer to the group shown positive words as temporarily non-hostile (TNH) whereas the group shown negative words as temporarily hostile (TH). We assumed that this priming manipulation would bias the interpretation of ambiguous-positive and ambiguous-negative behaviors of others via the activation of congruent schemas, such that a) for both ambiguous-positive and ambiguous-negative behaviors of others, the presentation of subsequent non-hostile intentions would elicit a larger N400 amplitude than hostile intentions in temporarily hostile individuals (TH), while (b) the presentation of hostile intentions following both ambiguous-positive and ambiguous-negative behaviors of others would elicit a larger N400 amplitude than non-hostile intentions in temporarily non-hostile individuals (TNH).

2. Methods

2.1. Participants

Participants were recruited at the Université de Montréal (Quebec, Canada) among undergraduate students and from the general population through advertisements placed on websites. The following exclusion criteria were communicated by e-mail to all respondents: 1) aged under 18 or over 35 years, 2) not having French as their mother tongue, (3) reporting a current or a past psychiatric diagnosis, (3) having a neurological problem, (4) having already suffered from a concussion and (5) taking medications that affect the central nervous system. Also, they were asked to complete online the French version of the Aggression Questionnaire (AQ, Buss & Perry, 1992; translated by Côté & Lalumière, 1999). This self-report questionnaire is composed of 29 items and evaluates the trait of aggressiveness according to four dimensions (i.e., Verbal aggression, Physical aggression, Anger, and Hostility) on a five-point Likert scale ranging from 1 (Extremely uncharacteristic of me) to 5 (Extremely characteristic of me). In our study, individuals with a score above 66 or equal (Meier et al., 2007) were excluded to ensure that all participants correspond to individuals with low trait aggression ($M = 31$, $SD = 11$, ranges 10–59). Thirty-eight participants were randomly divided into two groups and conditioned to be temporarily hostile (TH, $N = 18$) or temporarily non-hostile (TNH, $N = 20$) using the priming of negative or positive words. All participants received $20 (CAD) for their participation.

2.2. Materials and apparatus

2.2.1. Priming

We used the priming method with negative (e.g., frustrate) or positive words (e.g., compliment) to activate hostile or non-hostile concepts in participants. 40 words (20 positive words and 20 negative words) were randomly selected among target words used in Hostile expectancy violation paradigm (Gagnon et al. 2016) to create two priming lists (1 negative, 1 positive). We ensured that words from priming lists did not reappear as target words during the experiment. Half of our participants received a list containing only negative words to be conditioned as temporarily hostile (TH) and the other half received the positive words list to be conditioned as temporarily non-hostile (TNH). At the end of the experiment, participants were asked to write on a blank page all the words they remember from the list. Correctly reported words were counted to verify if the priming procedure worked. When subjects remembered less than 50% of words from the list, they were considered as unprimed, thus excluded from further analysis. Additionally, in order to ensure that the priming procedure activated the corresponding schema (hostile vs non-hostile), participants were asked to classify each behavior description spontaneously either as negative or positive just before to be informed of the intention related to behavior (see details in 2.2.3). Their spontaneous classification pattern was analyzed afterwards as a manipulation check of the priming manipulation.

2.2.2. Hostile Expectancy Violation Paradigm

The Hostile Expectancy Violation Paradigm (HEVP) was developed by Gagnon et al. (2016, 2017) to explore hostile attribution bias in aggressive and non-aggressive individuals. It included two lists of 160 daily-life social scenarios. Each scenario contained three sentences.

The first sentence established a social context (either non-hostile or hostile). The second sentence presented an ambiguous-aversive behavior. The third sentence provided an intention (either non-hostile or hostile) associated with the ambiguous-aversive behavior presented in the second sentence. Each list was composed of 80 scenarios of hostile intention (hostile condition) and of 80 scenarios of non-hostile intention (non-hostile condition). Half of the items of each condition was coherent with the social context (match) whereas the other half was incoherent (mismatch). Table I illustrates with examples four types of possible scenarios in the HEVP.

Table I. Examples of Four Types of Possible Scenarios in Hostile Expectancy Violation Paradigm

First sentence (social context)	Second sentence (ambiguous-aversive behavior)	Third sentence (intention)	Condition
Hostile Your neighbor is vengeful.	He plays his music all night.	Hostile He wants to *irritate* you.	Hostile match
Non-hostile Your neighbor likes to organize parties.	He plays his music all night.	Hostile He wants to *irritate* you.	Hostile mismatch
Hostile Before the exam, the students are in competition.	A friend walks by and does not talk to you.	Non-hostile He does not want to *distract* you.	Non-hostile mismatch
Non-hostile Before the exam, the students study seriously.	A friend walks by and does not talk to you.	Non-hostile He does not want to *distract* you.	Non-hostile match

Note. The translation from French to English makes the pronoun "you" as an ending word of the sentence. In the original version, scenarios finish with the critical word such as "irritate" (e.g., "Il veut vous irriter") and "distract" (e.g., "Il ne veut pas vous distraire").

In the present study, we wished to extend the HEVP to examine the intent attribution process not only with ambiguous negative/aversive behavior of others, but also with ambiguous positive/non-aversive ones as well. Thus, we created new social scenarios based on HEVP. The paradigm used in our study was similar to HEVP but we eliminated the social context to vary instead the types of ambiguous behavior. Each scenario consisted of a daily-life social behavior (ambiguous-negative or ambiguous-positive) and an intention (hostile or non-hostile). So, each behavior type (e.g., ambiguous-negative) either matched with following intention (e.g., hostile) or mismatched (e.g., non-hostile). Also ambiguous-neutral behaviors were used as filler scenarios. Table II shows the six types of social scenarios.

Table II. Examples of Six Types of Possible Scenarios Created Based on Hostile Expectancy Violation Paradigm

First sentence (behavior type)	**Second sentence (intention)**	**Condition**
Ambiguous-**negative** A driver behind you honks suddenly.	Hostile The driver wants to *irritate* you.	Match condition (ambiguous-negative-hostile)
Ambiguous-**negative** A driver behind you honks suddenly.	Non-hostile The driver wants to *inform* you.	Mismatch condition (ambiguous-negative-non-hostile)
Ambiguous-**positive** A friend greets you while you study.	Hostile Your friend wants to *disturb* you.	Mismatch condition (ambiguous-positive-hostile)
Ambiguous-**positive** A friend greets you while you study.	Non-hostile Your friend wants to *talk* to you.	Match condition (ambiguous-positive-non-hostile)
Ambiguous-neutral/ Filler At the airport, a customs officer looks at your passport photo.	Hostile The customs officer wants to *suspect* you.	N/A
Ambiguous-neutral / Filler At the airport, a customs officer looks at your passport photo.	Non-hostile The customs officer wants to *identify* you.	N/A

Note. The translation from French to English makes the pronoun "you" as an ending word of the sentence. In the original version, scenarios finish with the critical word such as "irritate" (e.g., "Il veut vous irriter"), "inform" (e.g., "Il veut vous informer"), "disturb" (e.g., "Il veut vous déranger"), "talk" (e.g., "Il veut vous parler"), "suspect" (e.g., "Il veut vous soupçonner") and "identify" (e.g., "Il veut vous identifier"). N/A, not applicable.

In total, there were 480 scenarios divided into two lists of 240 scenarios. Each list included 80 scenarios per type of behavior: the first 40 scenarios (1 to 40) paired with hostile intentions and the last 40 scenarios (41 to 80) paired with non-hostile intent. The pairing pattern was reversed in the second list for counterbalancing. Twelve scenarios among 80 (2 scenarios per behavior type) were randomly selected to be followed by comprehension questions (true or false) in order to check if subjects read carefully and understand the scenarios. We also added 6 scenarios (1 scenario per type of behavior) at the beginning of the lists to allow participants to practice and understand the task before starting the experiment. There were 12 blocks in total. Each block was composed of 19 experimental trials, 1 comprehension question and 1 short break period.

The order of experimental trials in each block was randomly determined and the priming words list that was part of the priming procedure according to the group was displayed once again on the screen for one minute just before the break. The cut off score of true-false comprehension questions was 9 correct answers among 12 questions (75%). The viewing distance of 57 cm was maintained throughout the experiment using a chin rest and stimuli were presented in white 14-point Helvetica font on a black background. The entire experiment was programmed and executed using the E-Prime computer software (E-Prime 1.2, Version 1.2.1.844).

2.2.3. Procedure

Participants were asked to memorize a list of 20 words for five minutes and to recall them at the end of the experiment. Then, they were placed in front of a computer screen to read social scenarios while imagining that they were actually interacting with fictional characters appearing in the scenarios. At each trial, a behavioral sentence was displayed on the screen for a minimum duration of 1500 ms until the participants pressed keys on a keyboard to classify the described behavior either as either positive or negative. Then, a fixation cross was presented in the center of the screen for 1000 ms, followed by an intention sentence presented word-by-word, each word for 300 ms with a blank interval of 200 ms between the consecutive words. Following the last word of the intention sentence, the fixation cross reappeared in the center of the screen for 2000 ms and participants were asked to maintain their eyes fixed to the cross without moving or blinking until the next scenario appears. In each block, one of the 20 scenarios was followed by a comprehension question (true-false) to verify if participants read the scenarios carefully. At the end of each block, the priming words list appeared and remained displayed on the screen for one minute. Participants were asked to make an effort to re-memorize them. After the experimental task on the computer, participants were asked to write on a paper the 20 words that they were memorizing before and during the experiment. Once the participants submitted their answers, they were informed about the study in detail and about the real purpose of memorizing the list of words which aimed to prime participants differently in order to create two groups according to nature of the activated schema, but not to evaluate their memory, *per se*.

2.2.4. EEG Recording

The electroencephalogram (EEG) was recorded using 64 active Ag/AgCl electrodes (Biosemi ActiveTwo System; Amsterdam, Netherlands) at a sampling frequency of 512 Hz and low-pass filtered at 134 Hz. Electrodes were mounted on an elastic cap according to the International 10-10 System (Sharbrough et al., 1991) and later referenced to the average of the right and the left mastoids (recorded with two additional electrodes). The voltage at two electrodes placed lateral to the external canthi was recorded and their difference used for the horizontal electro-oculogram (HEOG) to measure the horizontal eye movements and the voltage at an electrode placed below the left eye was recorded and the difference between this signal and the signal at Fp1 was used for the vertical electro-oculogram (VEOG) to measure the vertical eye movements and blinks. During offline analyses, a high-pass filter of 0.01 Hz and a low-pass filter of 30 Hz were applied to the EEG signals. The HEOG and VEOG signals were high-pass filtered at 0.1 Hz and low-pass filtered at 10 Hz. All EEG signals were time-locked to the target word onset and epoched from -200 ms to +800 ms with baseline correction using the average voltage on the 200 ms pre-stimulus interval. The electro-ocular artifacts were removed using an independent component analysis (ICA) for each participant using the method described in Drisdelle, Aubin, and Jolicoeur (2017). Following the ICA, the epochs with remaining noise on the VEOG (VEOG > 50 μV within a 150-ms time window) or/and HEOG (HEOG deflection > 35 μV within a 300-ms time window) were rejected. Scalp EEG channels for each epoch were also screened for artefacts, defined as a voltage exceeding ±100 μV on the -200 to +800 ms segmentation interval. When there were seven or fewer channels containing such artefacts in an epoch, these channels were interpolated from neighbors using spherical spline interpolation, but when there were more than seven channels containing such artifacts, the epoch was excluded from further analysis.

2.2.5. EEG data analysis

ERP averages were calculated for each stimulus condition (ambiguous-negative-hostile, ambiguous-negative-non-hostile, ambiguous-positive-hostile, ambiguous-positive-non-hostile). Then, the ERP mean difference (mismatch minus match) was calculated for each behavior type (ambiguous-negative-non-hostile minus ambiguous-negative hostile; ambiguous-positive-hostile minus ambiguous-positive-non-hostile).

ICA is often used to detect artifacts by its ability to decompose overlapping ERP signals into several distinct sources. This unmixing process of overlapped ERP signals without relying on any knowledge of the source signals is called blind source separation. Hence, ICA is a form of blind source separation by its capacity to separate mixed ERP signals into temporally independent brain sources (see Makeig & Onton, 2009). In our study, we used ICA not only for the artifact detection, but also to separate ERP components underlying the experimental conditions. To do this, we concatenated the ERPs for each condition, for each subject, into a single matrix and decomposed this matrix using ICA (see Dell'Acqua et al., 2015; Makeig et al., 1999a, 1999b; see also Dien & Frishkoff, 2005). This method produces stable spatial components each of which has associated timecourses (for each condition and subject). We then analyzed the waveforms corresponding to the main ICA components to isolate the N400 effect from other temporally and spatially overlapping brain activity. Thus, we focused particularly on scalp distributions and waveforms related to the N400 effect, such as centro-parietal region and activity between 400 and 600 ms (Kutas & Federmeier, 2011; Gagnon et al., 2016, 2017).

Because the number of scenarios used in this study was twice that used in previous work (Gagnon et al., 2016), we examined the possible effect of habituation due to repetition. More specifically, we were aware of the possible decrease in manipulation effects over time (Srull & Wyer, 1979) and by the fact that participants came to expect violations of expectations after certain number of scenarios. In order to examine this possibility, we subdivided the data into two subsets: the first six blocks versus the last six blocks. Statistical analyses were performed with separate 2x2x2 mixed ANOVAs to investigate the effects of Intention (hostile, non-hostile), Block (first six blocks, last six blocks) and Group (TH: temporarily hostile, TNH: temporarily non-hostile) for each behavior type (ambiguous-negative and ambiguous-positive).

3. Results

Of 47 participants initially recruited, nine were excluded from the study: five individuals remembered less than half of priming words at the end of the experiment, one individual obtained a score under the cut off score (fewer than 9 correct answers among 12) in true-false comprehension questions, one individual had a high rate (38.16%) of non-brain artifacts, and two individuals had technical problems during the EEG recording. The final sample was composed of 38 participants (age: $M = 23.42$, $SD = 4.38$; 8 males) randomly assigned to one of two groups and primed with either negative or positive words to be temporarily hostile (TH; $N = 18$, $M = 23.42$ years of age, $M = 16.00$ years of education) or temporarily non-hostile (TNH; $N = 20$, $M = 23.80$ years of age, $M = 16.40$ years of education).

3.1. Behavioral data: manipulation check

The percentage of positive and negative classification for each type of behavior (ambiguous-negative, ambiguous-positive) performed by the two groups (TH, TNH) were analyzed to verify if the priming manipulation effect was effective. We computed the percentage of incorrectly classified behaviors for ambiguous-positive behaviors (AP) classified as negative and ambiguous-negative behaviors (AN) classified as positive and submitted each of these to a one-way ANOVA comparing the means for the two groups. Temporarily hostile individuals ($M = 25.22\%$, $SD = .07$) classified the ambiguous-positive behaviors more negatively than temporarily non-hostile individuals ($M = 19.41\%$, $SD = .08$), $F(1, 36) = 6.32$, $p < .016$. Temporarily non-hostile individuals ($M = 18.09\%$, $SD = .11$) classified the ambiguous-negative behaviors more positively than by temporarily hostile individuals ($M = 11.84\%$, $SD = .05$), $F(1, 36) = 4.93$, $p < .033$. These results suggest the priming procedure designed to activate the hostile schema in the TH group and the non-hostile schema in the TNH group was effective.

3.2. Electrophysiogical data

The ERPs for each condition and subject were first subjected to singular value decomposition (SVD) to determine the dimensionality of the subspace of interest (Dien & Frishkoff, 2005). The scree plot (Cattell, 1966) based on the SVD suggested that six components should be retained for more detailed analysis. We constrained the ICA decomposition to this subspace and obtained the six scalp distributions shown in Figure 1, and their associated timecourses. Component 1 (labeled IC1 in the figure) appeared to represent the centroparietal distribution of the N400-like effect we expected to be produced by violations of expectations in our paradigm. We thus focused further analyses on this component.

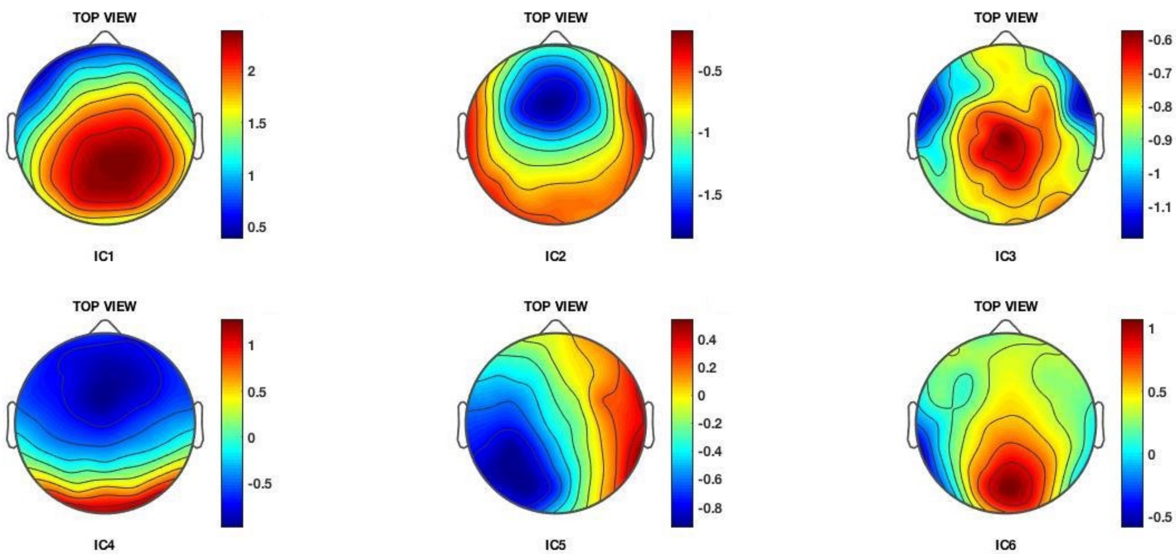

Figure. 1. Scalp distributions of the six ICA components (IC1 to IC6) obtained by the joint decomposition of the 38 ERP data sets in the experiment. The polarity (positive or negative) of the scalp maps needs to be multiplied by the associated timecourses shown in Figures 2 and 3 to determine whether the original ERPs, or the direction of factor effects, were positive or negative. Similarly, the value in the map at a given electrode location, multiplied by the corresponding activation waveform, gives the amplitude of the component in the original ERP space (in microvolts).

For each behavior type, we analyzed the timecourse waveforms for IC1 produced by the presentation of hostile and non-hostile intentions. The grand average of these timecourses are shown in Figure 2.1 and 2.2 for each group and condition. The grand average of the mean difference waveforms (mismatch minus match conditions) for each and condition are shown in Figure 3. Visual inspection of these difference waveforms revealed a negative deflection between 400 and 600 ms following the onset of a critical word that violated expectations. Thus, a window of 400–600 ms was selected for further analysis of this N400 effect.

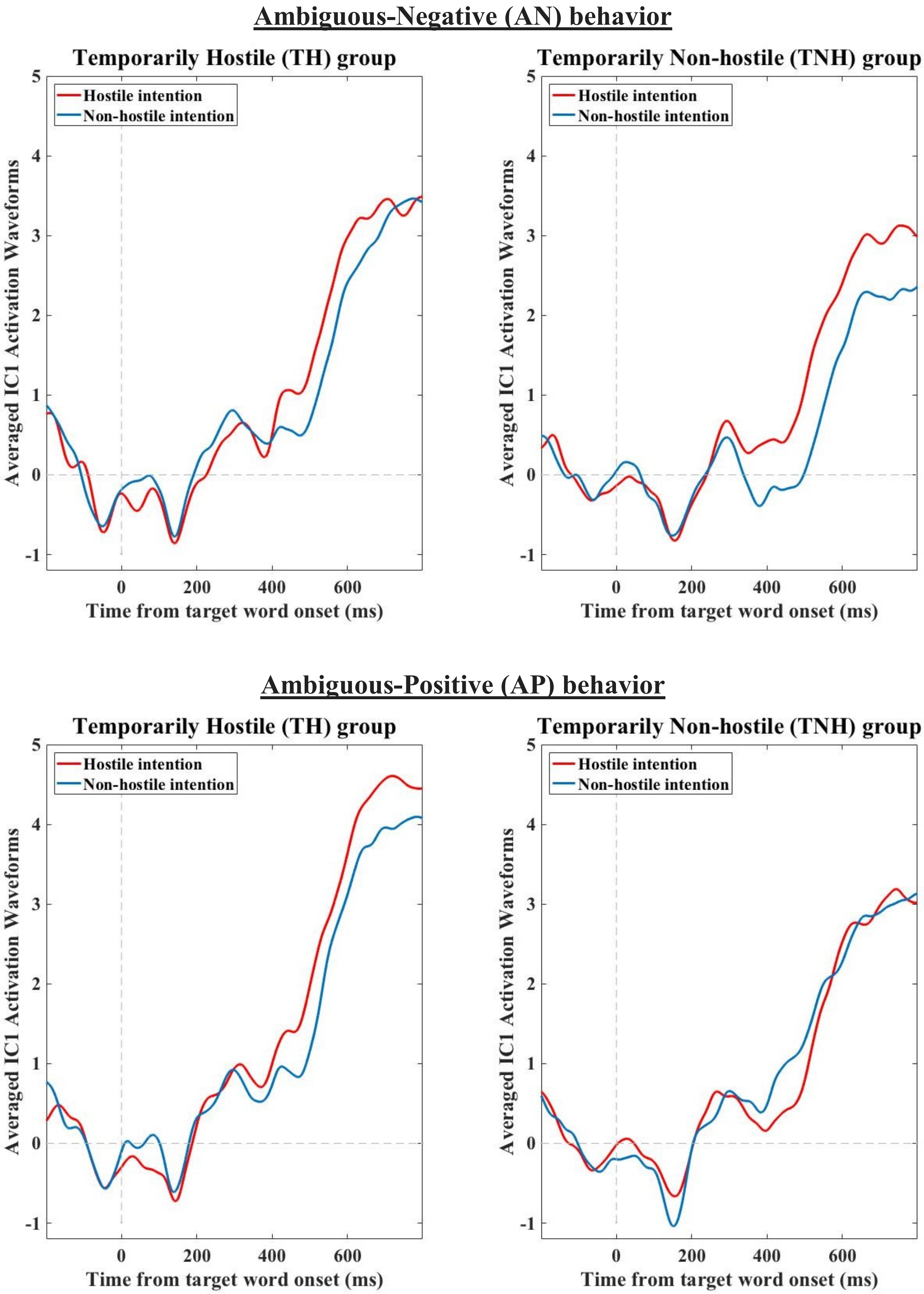

Figure. 2.1. Data of first six blocks. The figures illustrate IC1's activation timecourses and its averaged activation waveforms at each time point. Each averaged activation waveform needs to be multiplied by the value in IC1's scalp distribution at a given electrode (Figure 1) to obtain the amplitude of IC1 in the original ERP space (in microvolts).

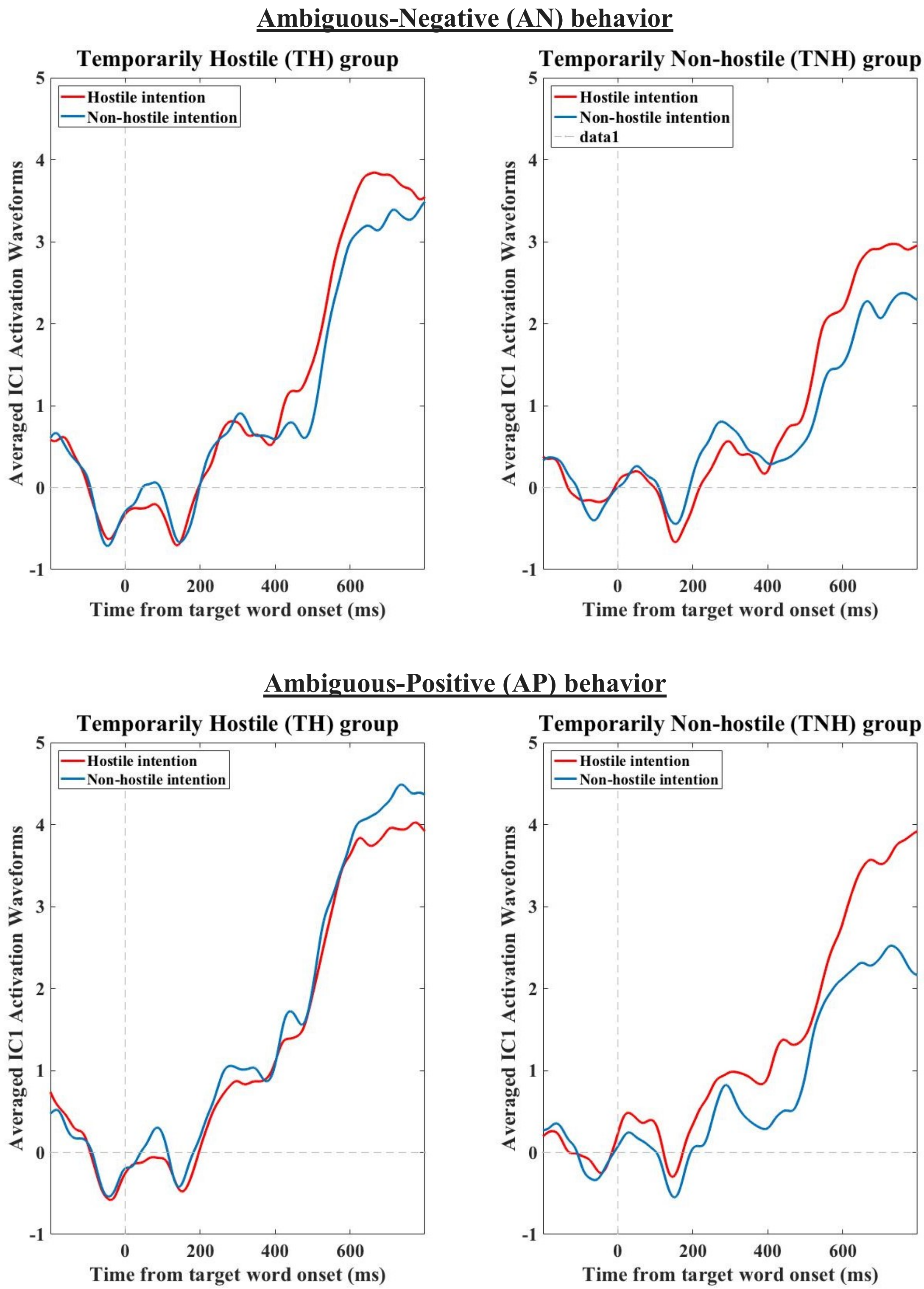

Figure. 2.2. Data of last six blocks. The figures illustrate IC1's activation timecourses and its averaged activation waveforms at each time point. Each averaged activation waveform needs to be multiplied by the value in IC1's scalp distribution at a given electrode (Figure 1) to obtain the amplitude of IC1 in the original ERP space (in microvolts).

For ambiguous-negative (AN) behaviors, a significant main effect of Block was found, $F(1, 36) = 4.49$, $p < .05$, $\eta_p^2 = .11$, indicating that the AN behaviors' waveforms were more negative in the first six blocks ($M = -.35$, $SD = .23$) than in the last six blocks ($M = .03$, $SD = .25$). There was also a significant main effect of Intention, $F(1, 36) = 5.11$, $p < .03$, $\eta_p^2 = .12$, with the waveforms more negative in ambiguous-negative non-hostile condition (Mismatch; $M = -.41$, $SD = .25$) than in ambiguous-negative hostile condition (Match; $M = .09$, $SD = .24$) for both temporarily hostile and temporarily non-hostile groups. However, there were no significant group difference ($F(1, 36) = 1.78$, $p > .19$, $\eta_p^2 = .05$), nor significant interactions (all $Fs < .35$, $ps > .56$, $\eta_p^2 s < .01$).

For ambiguous-positive (AP) behaviors, a significant interaction was observed between Block x Intention x Group, $F(1, 36) = 5.62$, $p < .024$, $\eta_p^2 = .14$. Pairwise comparisons with the Bonferroni correction indicated that the waveforms of hostile intention (Mismatch condition; $M = -4.13$, $SD = .32$) were significantly ($p < .05$) more negative than those of non-hostile intention (Match condition; $M = .18$, $SD = .32$) underlying the presence of the N400 for temporarily non-hostile (TNH) group in the first six blocks. There was also a significant ($p < .01$) difference between hostile and non-hostile intentions in the last six blocks for the TNH group, but the waveforms of ambiguous-positive hostile condition (Mismatch; $M = 2.46$, $SD = .34$) were more positive than those of ambiguous-positive non-hostile condition (Match; $M = -.56$, $SD = .26$). There was no significant ($p > .05$) difference found between mismatch and match conditions for temporarily hostile (TH) group in the first and the last six blocks, but the waveforms of non-hostile intentions (mismatch condition; $M = -.21$, $SD = .41$) were slightly more negative than those of hostile intentions (match condition; $M = .86$, $SD = .43$) in the first six blocks, indicating a tendency of the N400 effects.

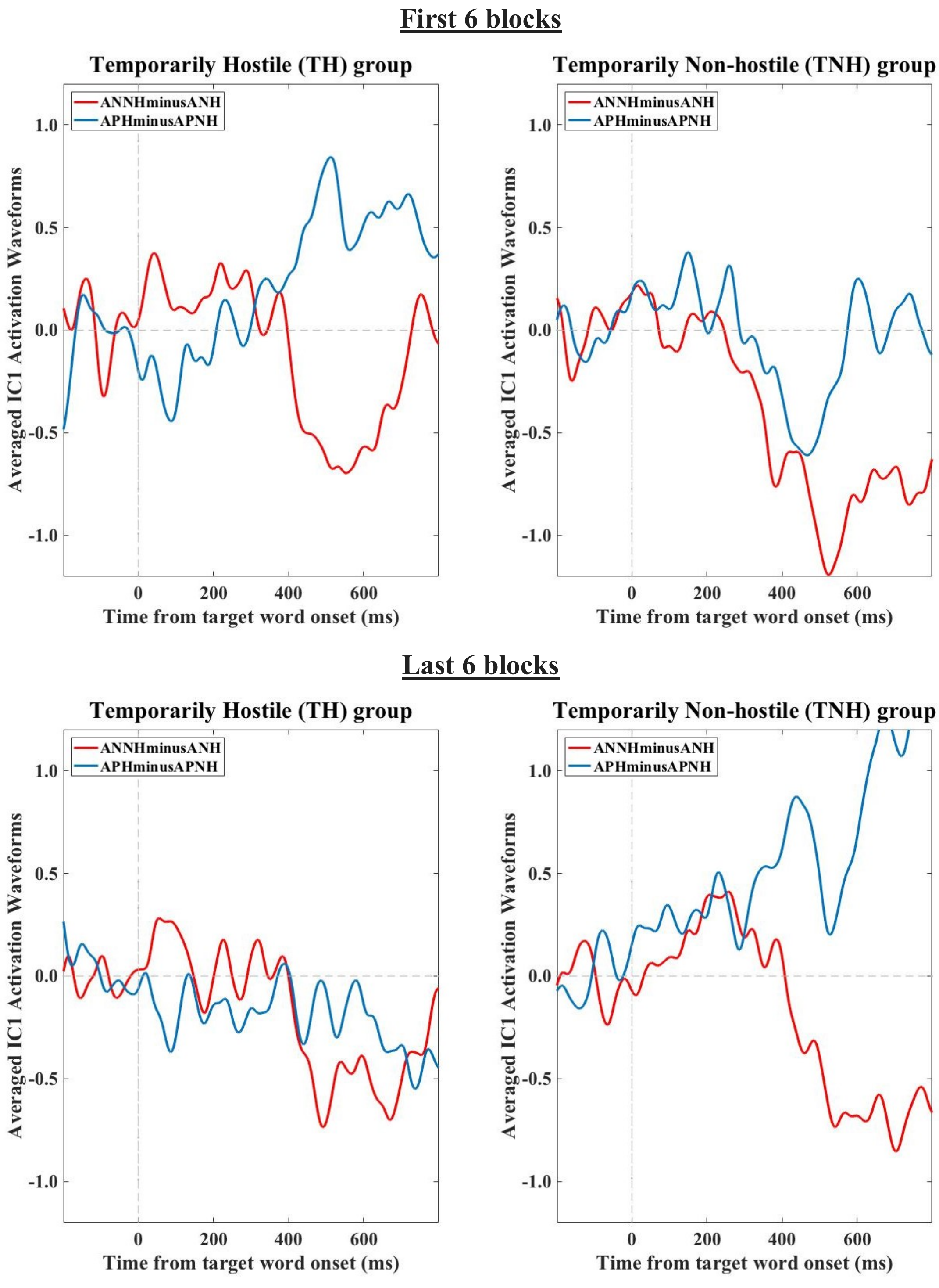

Figure 3. IC1's averaged activation waveforms of the mean difference ERP waveforms measured during the first six blocks and the last six blocks. The mean difference waveforms were obtained by averaging the ERP match minus ERP mismatch waveforms for each condition (ambiguous-negative-non-hostile minus ambiguous-negative-hostile, ANNHminusANH; ambiguous-positive-hostile minus ambiguous-positive-non-hostile, APHminusAPNH). Each averaged activation waveform needs to be multiplied by the value in IC1's scalp distribution at a given electrode (Figure 1) to obtain the amplitude of IC1 in the original ERP space (in microvolts).

4. Discussion

Our general aim is to understand cognitive structures and processes that influence social interactions that sometimes end in aggression (Björkqvist et al., 2000). We hypothesize these interactions are influenced by cognitive schemas used to filter and interpret the intentions of others. Here we sought to demonstrate that positive and negative schemas can be primed and that such priming modulates the likelihood of hostile and non-hostile intent attributions. We investigated these attributions (or expectations) by measuring ongoing electric brain activity (EEG) and analyses that isolate differences between confirmations and violations of expectations in a social context.

Normal, non-aggressive, participants were randomly assigned to two groups and asked to read hostile or non-hostile word sets. We argue, and provide evidence, that this procedure primed the tendency to interpret later social interactions as being more or less likely to reflect hostile intentions in others. Participants were asked to read 240 social scenarios, each consisting of a sentence describing an ambiguous behavior of others and of a sentence revealing an intention behind the behavior. Their task was first to read and to classify ambiguous behavior sentences spontaneously either as positive or negative and then to read carefully intention sentence presented word by word. There were two types of ambiguous behaviors (ambiguous-negative and ambiguous-positive) and two types of intention (hostile and non-hostile). The nature of the ambiguous behavior and of the underlying intention could be congruent (i.e., an ambiguous-positive behavior followed by a non-hostile intention or an ambiguous-negative behavior followed by a hostile intention; "match"), or incongruent (i.e., an ambiguous-positive behavior followed by a hostile intention or an ambiguous-negative behavior followed by a non-hostile intention; "mismatch").

We hypothesized priming of a hostile schema in non-aggressive individuals would increase the likelihood of attributing hostile intentions to ambiguous behaviors of others, regardless of whether these ambiguous behaviors were positive or negative. Conversely, priming a non-hostile schema would lead to more attributions of non-hostile intentions in others regardless of the nature of others' ambiguous behaviors. Thus, a larger N400 amplitude was expected for ambiguous behaviors followed by non-hostile intentions than ambiguous behaviors followed by hostile intentions in temporarily hostile individuals, whereas it was expected that hostile intentions would elicit a larger N400 amplitude than non-hostile intentions in temporarily non-hostile individuals regardless of the nature of ambiguous behaviors of others.

We analyzed the data by subdividing them in two subsets (first six blocks, last six blocks) to determine if the manipulations varied in strength across the first and second halves of the experiment. Indeed, it was found that the results in the last six blocks were significantly different from those in the first six blocks. Unexpected intentions tended to elicit weaker (significantly less negative) waveforms (smaller N400) in the last six blocks than in the first six blocks. In particular, temporarily non-hostile individuals spontaneously inferred non-hostile intentions in the first six blocks while reading ambiguous-positive behaviors of others, but they instead inferred hostile intentions in the last six blocks. These results suggest that the waveforms in the last six blocks were possibly influenced by the habituation to excessive violation of expectations. After repeated exposure to unexpected intentions, participants may have come to expect such violation of expectations, which resulted in a smaller effect of priming and even may have paradoxically led them to expect the unexpected intentions. In any case, our hypotheses were verified only in the first six blocks, and were not confirmed in the last six.

The ambiguous behavior classifications (negative versus positive) were also analyzed to verify if the priming with hostile and non-hostile words efficiently worked to active the schema of participants. The results showed that individuals primed with hostile words classified ambiguous-positive behaviors of others significantly more negatively than individuals primed with non-hostile words, while the latter classified ambiguous-negative behaviors of others significantly more positively than the former. The difference in behavior classification pattern between two groups suggests the priming manipulation was successful and biased non-aggressive individuals to be temporarily hostile (TH) or temporarily non-hostile (TNH) by activating the corresponding schema.

Most importantly, ERP results suggested we could track the attribution of intentions in others via careful analysis of electric brain activity. For ambiguous-positive (AP) behaviors, the mismatch condition was defined as the one when they were followed by hostile intentions and the match condition was defined as the one when they were followed by non-hostile intentions. As expected, the results showed that the waveforms of mismatch condition (hostile intention) in AP behaviors were significantly more negative than the waveforms of match condition (non-hostile intention) for temporarily non-hostile (TNH) individuals. This means that the TNH individuals spontaneously inferred non-hostile intentions by reading AP behaviors, so when hostile intentions were presented, they experienced cognitive inconsistency and this resulted in a negative deviation between 400–600 ms after the stimulus onset.

The opposite pattern was observed for temporarily hostile (TH) individuals with AP behaviors. The waveforms of match conditions (non-hostile intention) in AP behaviors were slightly more negative than those of mismatch conditions (hostile intention) for TH individuals, but they were not significantly different. In other words, TH individuals spontaneously inferred hostile intentions while reading AP behaviors, but not as often to be significantly different from the match condition.

For ambiguous-negative (AN) behaviors, the mismatch condition was the one with the presentation of non-hostile intentions and the match condition was the one with the presentation of hostile intentions. As expected, the waveforms of mismatch the condition were significantly more negative than those of match condition for TH individuals, indicating that hostile intentions were spontaneously inferred from AN behaviors. Contrary to our expectation, the same pattern was observed with TNH individuals. Indeed, the results showed that the presentation of non-hostile intentions elicited waveforms significantly more negative than hostile intentions. That is, TNH individuals inferred hostile intentions from AN behaviors so that non-hostile intentions preceded by AN behaviors were inconsistent for them.

In sum, the current study demonstrated that the activation of hostile and non-hostile schemas in non-aggressive individuals by priming influence how they interpret and infer intentions associated with ambiguous-negative and ambiguous-positive behaviors of others in a social context. On the one hand, the activation of a hostile schema led non-aggressive individuals to attribute hostile intentions more frequently than non-hostile intentions to ambiguous-negative (AN) behaviors of others. This result is consistent with previous studies that demonstrated the hostile attribution bias with negatively primed non-aggressive subjects (Meier et al, 2007; Todorov & Bargh, 2002). Although this attribution pattern was not found statistically significant for ambiguous-positive (AP) behaviors, there was a tendency to attribute hostile intentions by temporarily hostile individuals. Despite the fact that the nature of the ambiguous behavior of others was positive (e.g., a friend who greets you while you study), there was a tendency to interpret the behavior as having a hostile intent due to the activation of a hostile schema that increased accessibility of hostile concepts.

On the other hand, the activation of a non-hostile schema led non-aggressive individuals to infer more often non-hostile intentions than hostile intentions in a spontaneous manner while reading description of ambiguous-positive behaviors of others. However, the activated non-hostile schema did not influence the intent attributions related to ambiguous-negative behaviors of others. Indeed, temporarily non-hostile individuals attributed more frequently hostile intentions than non-hostile intentions when the nature of ambiguous behaviors of others was negative. A similar result was found by Gagnon et al. (2016) with unprimed non-aggressive individuals. This finding can be explained from a developmental perspective. According to Dodge (2006), all human beings develop a hostile schema first during the toddler years and use it to attribute hostile intentions to ambiguous provocations from an early age. Then, they generally develop a non-hostile schema subsequently with age and learn to attribute non-hostile intentions to ambiguous provocations. Therefore, an ordinary child would grow with two types of schema (hostile and non-hostile) and use them accordingly to the nature (negative or positive) of behavior of others. However, as the hostile schema has been developed prior to the non-hostile schema and has been continuously used as an adaptive function ever since the toddler years to protect oneself against threats to our survival, it is expected that the semantic links that relate hostile concepts from one another would be stronger than the links that relate non-hostile concepts. That is, even a subtle and ambiguous negative cue would be sufficient to activate and access the hostile schema. If this is the case, the natural accessibility to the hostile schema when facing a negative cue during the experiment would have influenced the intention attribution processes more strongly than the artificial accessibility to the non-hostile schema via the priming procedure. The sensitivity of the non-hostile schema to positive cues might not be as high as the sensitivity of the hostile schema to negative cues. Consequently, the non-hostile schema has not been naturally activated in temporarily hostile individuals despite the presentation of ambiguous-positive behaviors and it did not influence their intent attribution processes. Further studies are needed in order to validate this hypothesis suggesting a non-reciprocal relationship between schema and intent attribution processes according to the hostile vs non-hostile nature of the schema.

Conclusion

To conclude, the present study demonstrated directly and in real time using EEG method that the activation of hostile and non-hostile schemas has the non-reciprocal effects on the intent attribution processes related to divers types of ambiguous behaviors in non-aggressive individuals and also that the activation of the non-hostile schema explains the non-hostile attributions in non-aggressive individuals. In addition, the results of our study supports the findings of Gagnon et al. (2016, 2017) on hostile intent attributions in non-aggressive individuals. Also, the use of the EEG method and the analysis of the N400 component by the violation of the expected intentions (Gagnon et al., 2016, 2017) appear to be valuable tools to measure spontaneously inferred intentions of ambiguous behaviors of others. Future research could address the relative sensitivity of hostile versus non-hostile schemas in relation to various positive and negative cues.

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Chapitre III : Conclusion générale

Conclusion générale

Selon le modèle théorique de Dodge (2006), les personnes non agressives utilisent les schémas hostile et non hostile selon les situations sociales données afin d'attribuer correctement les intentions, soient hostiles ou non hostile, à des comportements ambigus d'autrui alors que les personnes agressives sont plutôt biaisées vers l'utilisation du schéma hostile ce qui les mène à attribuer fréquemment des intentions hostiles. D'un côté, plusieurs études faisant appel à des paradigmes d'amorçage ont suggéré l'existence du schéma hostile chez les personnes non agressives et de son influence sur le processus d'attribution d'intention, en indiquant que les sujets non agressifs amorcés avec des stimuli négatifs ont attribué des intentions hostiles à des comportements ambigus aversifs d'autrui plus fréquemment que les sujets non agressifs non amorcés et aussi fréquemment que les individus agressifs non amorcés (Meier, Robinson et Wilkowski, 2007; Todorov et Bargh, 2002). D'un autre côté, les effets de l'activation du schéma non hostile sur le processus d'attribution d'intention ont été négligés dans la littérature. De ce fait, l'un peut possiblement se demander si les attributions d'intention non hostile sont les effets découlant de l'activation du schéma non hostile chez les personnes non agressives. En outre, si l'attribution d'intention hostile plus fréquente est réellement due à l'activation du schéma hostile par l'amorçage, il nécessite de le vérifier non seulement avec des comportements ambigus d'autrui de nature aversive (ou négative) utilisés les études antérieures, mais aussi avec des comportements ambigus d'autrui de nature non aversive (ou positive).

L'étude présentée dans le cadre de ce mémoire a eu pour objectif d'examiner les effets de l'activation des schémas hostile et non hostile sur le processus d'attribution d'intention lié à des comportements ambigus négatifs et positifs d'autrui chez les personnes non agressives, et ce, à l'aide d'un paradigme expérimental combinant la méthode d'amorçage et la méthode du potentiel relié aux évènements (ERP) enregistré grâce aux techniques d'électroencéphalographie (EEG). La méthode d'amorçage a été utilisée pour augmenter l'accessibilité aux concepts hostiles ou non hostiles, et ainsi activer le schéma hostile ou non hostile. Au début de l'expérience, nous avons amorcé un groupe de participants avec des mots négatifs pour activer leur schéma hostile et l'autre groupe avec des mots positifs pour activer leur schéma non hostile. Par la suite, ils ont été demandés de lire des scénarios sociaux construites dans le but de violer des attentes hostiles et non hostiles. Chaque scénario a été composé d'une phrase décrivant un comportement ambigu soit positif ou soit négatif d'un personnage fictif et d'une phrase révélant la vraie intention soit hostile ou non hostile du personnage derrière son comportement ambigu. À l'aide de l'EEG, nous avons mesuré de manière objective et en temps réel les activités neurales sous-jacentes le processus d'attribution d'intention qui se produit spontanément. Nous avons analysé la composante N400 ERP associée à la présentation des intentions inattendues et par la présence ou l'absence d'un effet de la N400, nous avons pu connaître le type d'intention attribuée par les participants à des comportements ambigus d'autrui présentés précédemment. Les résultats obtenus dans cette étude ont montré que l'activation du schéma non hostile chez les personnes non agressives entraîne l'attribution des intentions non hostiles de façon similaire que l'activation du schéma hostile entraîne l'attribution des intentions hostiles. Cependant, cette influence du schéma non hostile sur le processus d'attribution d'intention a été observée seulement avec des comportements ambigus positifs d'autrui. Face aux comportements ambigus aversifs d'autrui, les individus temporairement non hostiles (TNH) ont attribué des intentions hostiles malgré l'activation de leurs schémas non hostiles par l'amorçage des mots non hostiles. En revanche, les individus temporairement hostiles (TH) ont attribué constamment des intentions hostiles sans égard à la nature des comportements ambigus d'autrui.

Ces résultats sont cohérents avec le modèle de Dodge (2006) qui stipule que les personnes non agressives possèdent deux types de schémas (hostile et non hostile) et qu'ils sont capables d'attribuer des intentions hostiles et non hostiles. De plus, ces résultats ont mis en valeur la différence au niveau de la sensibilité d'activation entre le schéma hostile et le schéma non hostile. En effet, le schéma hostile, qui est universel chez l'être humain, se développe avant le schéma non hostile et il est constamment utilisé depuis très jeune âge comme une fonction adaptative contre des menaces à la survie (Dodge, 2006). Donc, il est probable que le schéma hostile des personnes non agressives soit naturellement plus sensible et qu'il est plus facilement accessible que le schéma non hostile. Il nous semble donc important de vérifier cette hypothèse de la sensibilité de l'activation des schémas chez les personnes non agressives et de prendre en compte l'existence de ce facteur dans les futures études traitant de l'effet de l'activation des schémas cognitifs sur les processus d'attribution d'intention.

Il existe certaines limites dans notre étude. La première limite concerne l'influence possible de la tâche de classification des comportements ambigus d'autrui sur le processus d'attribution d'intention subséquente. La tâche de classification a été introduite dans notre étude afin vérifier si l'amorçage avec des mots négatifs ou positifs a effectivement activé les schémas correspondants. Cependant, le fait de classer un comportement comme étant positif ou négatif peut induire les participants à attribuer les intentions cohérentes à la nature identifiée du comportement. Toutefois, des analyses exploratoires non rapportées dans l'article montrent qu'il n'y a pas de corrélation significative entre les amplitudes de la composante N400 et le pourcentage de la classification des comportements ambigus positifs ($r(36) = ,01$, $p > ,10$) ni des comportements ambigus négatifs ($r(26) = ,02$, $p > ,10$), ce qui assure que le processus d'attribution d'intention n'a pas été influencé par la classification des comportements dans notre étude. La deuxième limite est liée aux scénarios utilisés dans notre étude. Comme les participants n'ont pas tous les mêmes expériences sociales, ils peuvent éprouver de la difficulté à imaginer des scénarios représentant des situations sociales non vécues. Par exemple, la personne n'ayant pas de frères ou sœurs peut difficilement imaginer les interactions avec eux ou du moins, elle aura plus de mal à les imaginer qu'une personne qui a des frères ou sœurs. Si certains comportements ambigus sont difficiles à reproduire mentalement, les intentions abstraites découlant de ces comportements devraient être encore plus difficiles à être imaginés. Malheureusement, ce facteur n'a pas été contrôlé dans notre étude. La troisième limite est en lien avec l'échantillon. L'âge moyen des participants ($M = 23,42$, $SD = 4,38$) ne représente pas tout à fait bien la population d'intérêt qui est les individus âgés entre 18 et 35 ans dont la moyenne est 27 ans. De plus, la proportion de femmes par rapport à celle des hommes dans l'échantillon est inégale (30 femmes vs 8 hommes). Ces facteurs limitent la généralisation des résultats obtenus dans notre étude à l'ensemble de la population.

Malgré ces limites, notre étude est la première à démontrer, de manière directe et en temps réel à l'aide d'EEG, l'activation du schéma non hostile en tant qu'origine des attributions non hostiles chez les personnes non agressives, à comparer les effets d'activation des schémas hostile et non hostile sur le processus d'attribution d'intention vis-à-vis différents types de comportements ambigus, et à suggérer les effets non réciproques de l'activation des schémas hostile et non hostile sur la façon dont les individus non agressifs attribuent les intentions à autrui. De plus, les résultats de notre étude ont corroboré les données de Gagnon et al. (2016, 2017) sur les attributions d'intention hostile chez les individus non agressifs. Sur le plan théorique, l’étude montre que tous les deux types de schémas sont importants et nécessaires chez les individus non agressifs, autant le schéma non hostile que le schéma hostile pour la valeur adaptative. Sur le plan clinique, le fait que les individus non agressifs traitent les informations sociales de manière similaire aux individus agressifs par l’influence des contextes hostiles permet de concevoir les individus agressifs et non agressifs sur le même continuum d’agressivité, plutôt que deux catégories de personnes rationnellement différentes.

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